

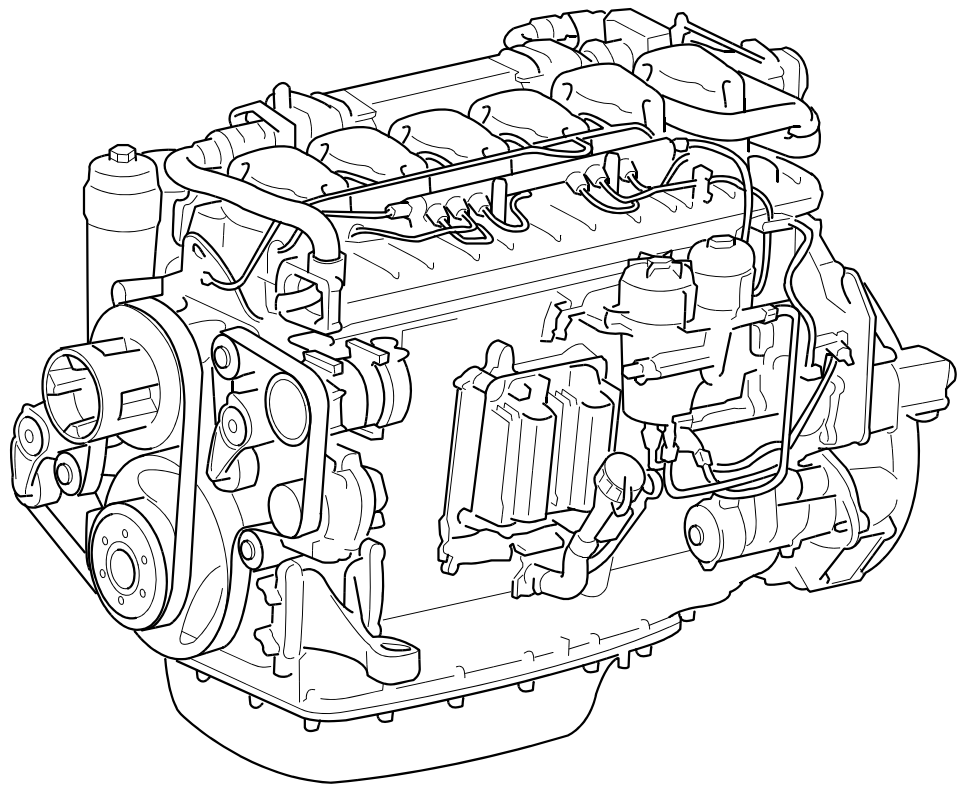
SCANIA

00:23-03

Issue 7.0 **en-GB**

Maintenance instructions DC13 industrial engine with XPI

E2011



336 505

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Maintenance

The maintenance programme covers a number of points that are divided into the following sections:

- Lubrication system
- Cooling system
- Air cleaners
- Fuel system
- Other



WARNING!

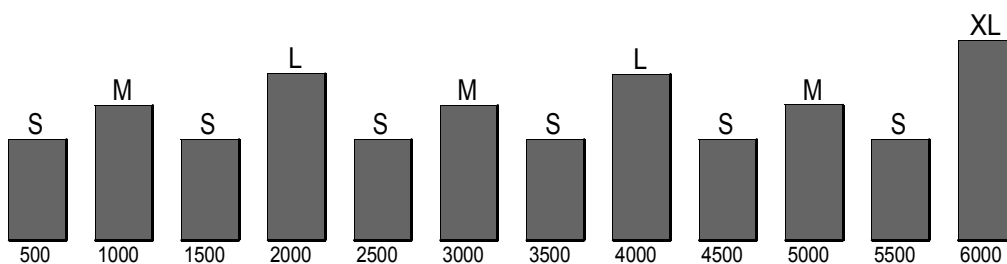
Block the starting device when working on the engine. If the engine starts unexpectedly, there is a serious risk of injury.

There is always a risk of sustaining burns when an engine is hot. Particularly hot parts are turbochargers, oil sumps, hot coolant and oil in pipes and hoses.

The maintenance programme includes the following:

- S maintenance: Minimum basic maintenance.
- M maintenance: More extensive maintenance.
- L maintenance: Includes nearly all maintenance items.
- XL maintenance: Includes all maintenance items.

During a period, the sequence is S-M-S-L-S-M-S-L-S-M-S-XL.



313 153



IMPORTANT!

On delivery a Scania engine is optimised for its application. However, regular maintenance is necessary to:

- prevent unplanned stops
- extend the service life of the engine
- maximise the long-term emission performance of the engine
- give the best possible operating economy.

Cleaning the engine



WARNING!

Beware of hot water. Use suitable protective equipment.



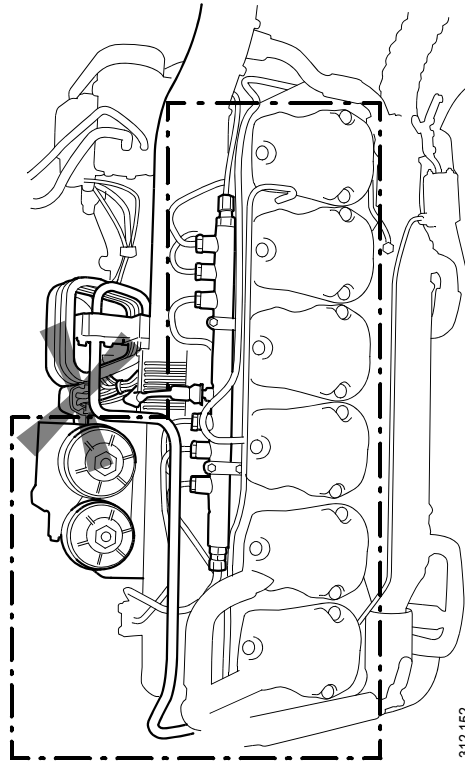
Environment

The washing water must be disposed of in compliance with the relevant national and international regulations.

The engine must be cleaned before starting work.

Clean the engine with hot water. Also use a degreasing agent, if necessary.

Avoid spraying water on the engine control unit, see illustration.



Clean within the marked area.

Engines with few hours of operation



IMPORTANT!

On engines with few hours of operation, maintenance must be carried out annually or every 5 years.

Stand-by generator sets and the like that are not used regularly should be test run and checked in accordance with the manufacturer's instructions.

The following maintenance items must be carried out once the engine has been warmed up to operating temperature.

1. Checking the oil level.
2. Checking the coolant level.
3. Checking the vacuum indicator.
4. Checking the fuel level.
5. Check for engine leaks.

Maintenance interval

	Daily	First time at		Interval (hours)					At least	
		first start	500	500	1,000	2,000	6,000	annually	every 5 years	
			R	S	M	L	XL			
Lubrication system										
Checking the oil level	X	X								
Changing the oil			X	X	X	X	X	X		
Cleaning the centrifugal oil cleaner			X	X	X	X	X	X		
Renewing the oil filter			X	X	X	X	X	X		
Cooling system										
Checking the coolant level	X	X	X	X	X	X	X			
Checking coolant antifreeze and corrosion protection		X				X	X	X		
Changing the coolant and cleaning the cooling system							X		X	
Air cleaners										
Reading the air cleaner vacuum indicator	X		X	X	X	X	X			
Renewing the air cleaner filter element						X	X		X	
Renewing the air cleaner safety cartridge						X	X		X	
Fuel system										
Checking the fuel level	X	X								
Renewing the fuel filter					X	X	X		X	
Other										
Checking the drive belt		X			X	X	X	X		
Checking for leaks	X			X	X	X	X			
Checking and adjusting the valve clearance			X			X	X			
Renewing the reductant filter					X	X	X	X		
Cleaning the reductant tank filler filter				X	X	X	X			
Cleaning the reductant tank ventilation filter					X	X	X			

Lubrication system

Oil grade

Scania LDF stands for the Scania Long Drain Field test standard. Approved Scania LDF oils have been carefully selected after extensive testing. The approval is only granted to the highest quality engine oils available on the market.

Recommended oil
Scania Oil LDF-3
Scania Oil LDF-2
Scania Oil LDF
Scania Oil E7

The engine oil must fulfil the following quality requirements:

- ACEA E5/API CI-4
- ACEA E7/API CI-4+ for fuel with maximum 15 ppm sulphur content (0.0015%)
- For engines not run on low-sulphur fuel, the TBN (Total Base Number) should be at least 12 (ASTM 2896).
- Oils with a low ash content (ACEA E9/API CJ4) are not recommended.

Check with your oil supplier that the oil meets these requirements.

If the engine is used in areas of the world where lubricating oil with ACEA or API classification is not available, the oil grade must be measured in actual operation. In this case contact the nearest Scania workshop.

For operation at extremely low outdoor temperatures: Consult your nearest Scania representative on how to avoid starting difficulties.

Viscosity class	Outdoor temperature	
SAE 20W-30	-15°C (5°F)	- +30°C (86°F)
SAE 30	-10°C (14°F)	- +30°C (86°F)
SAE 40	-5°C (23°F)	- > +45°C (113°F)
SAE 50	0°C (32°F)	- > +45°C (113°F)
SAE 5W-30	< -40°C (-40°F)	- +30°C (86°F)
SAE 10W-30	-25°C (-13°F)	- +30°C (86°F)
SAE 15W-40	-20°C (-4°F)	- > +45°C (113°F)

Oil analysis

To be able to extend the oil change intervals using an oil analysis, Scania LDF-2 and LDF-3 oils must be used. Oil companies can offer analysis of the engine oil.

The following conditions must remain fulfilled when the oil is changed.

- Viscosity at 100°C (212°F): max. $\pm 20\%$ of original value of the fresh oil.
- TBN (in accordance with ASTM D4739): > 3.5
- TBN (in accordance with ASTM D4739): > TAN (in accordance with ASTM D664)
- Soot (DIN 51452): < 3%

Such analysis measures the oil's TBN (Total Base Number), TAN (Total Acid Number), fuel dilution, water content, viscosity and the quantity of particles and soot in the oil. The result of a series of analyses is used as the basis for establishing a suitable oil change interval.

If the conditions are changed, a new oil analysis programme must be carried out to establish new change intervals.

Checking the oil level

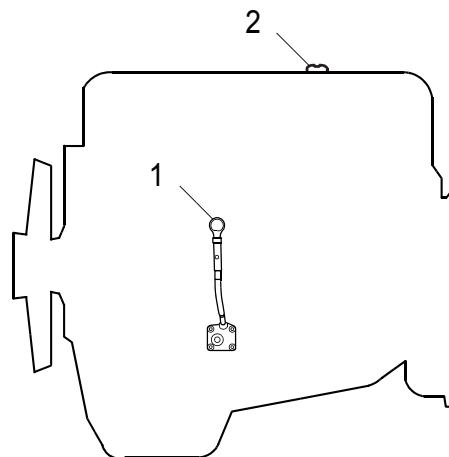
Checking the oil level with the engine switched off

Note:

Leave the engine off for at least 7 minutes before checking the oil level.

1. Remove the oil dipstick (1) and check the oil level. The correct level is between the minimum and maximum marks on the oil dipstick.
2. Fill with more oil (2) when the oil level is at or below the lower mark.

For information on the correct oil type, see the Oil grade section.



312 506

Changing the oil



WARNING!

Hot oil can cause burns and skin irritation. Wear protective gloves and eye protection when changing hot oil. Make sure that there is no pressure in the lubrication system before starting work on it. The oil filler cap must always be in place when starting and running the engine to prevent oil being ejected.

Note:

Renew the oil filter and clean the centrifugal oil cleaner when changing oil.

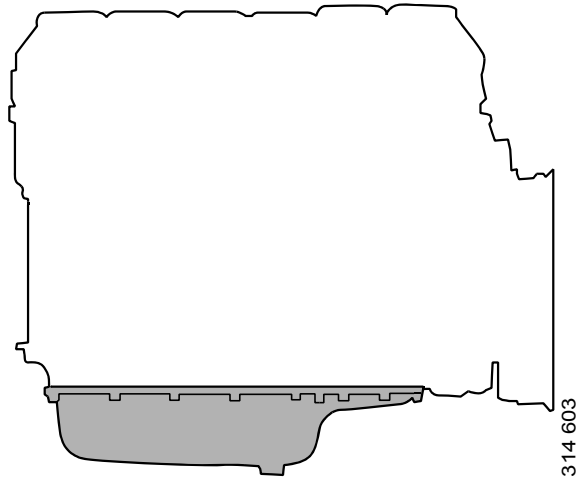
Change oil more often if the engine is subjected to particularly demanding operation, such as a dusty environment, or if deposits in the centrifugal oil cleaner are thicker than 28 mm (1.1 in).



Environment

Use a container to avoid spillage. Used oil must be disposed of as specified in national and international laws and regulations.

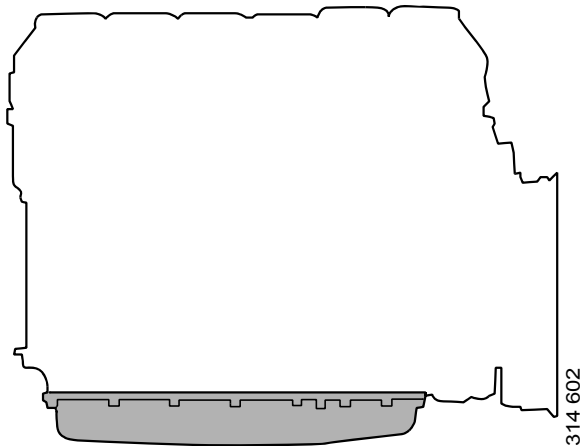
1. Unscrew the oil plug and drain the oil when the engine is hot. In certain engines the oil is pumped out by means of a bilge pump.
When draining with the valve, the oil should be hot. Alternatively, use a pump. This is so that draining occurs more quickly.
2. Clean the magnet on the oil plug.
3. Refit the oil plug.
4. Fill with oil.
5. Check the level on the oil dipstick.



Deep front, with ladder frame:

Min. 39 litres (10.3 US gallons).

Max. 45 litres (11.9 US gallons).



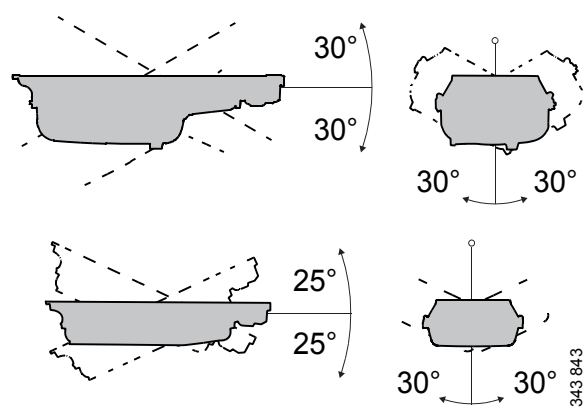
Low, with ladder frame:

Min. 28 litres (7.4 US gallons).

Max. 34 litres (9 US gallons).

Maximum angles of inclination during operation

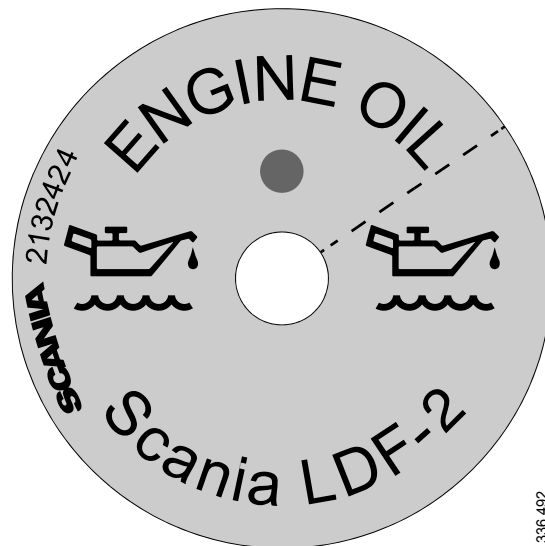
Maximum permissible angles during operation vary, depending on the type of oil sump; see illustration.



Labels for top-up engine oil grade

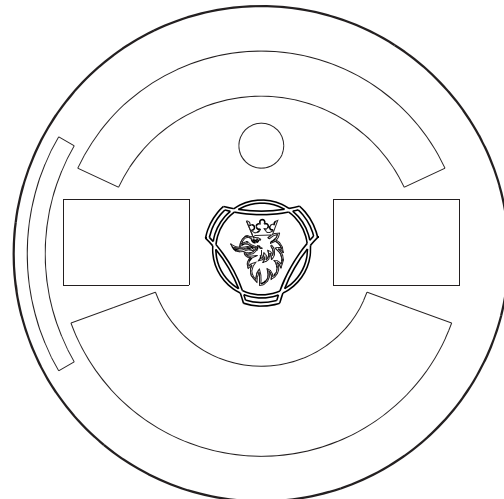
When changing oil it is important to use the correct engine oil grade.

The oil filler cap must be clearly marked with a label showing the top-up oil grade. If the label is missing or if the engine oil grade is changed, a new label must be fitted.



336 492

Filling label in the cylinder block.



353 114

Filling label in the rocker cover.

Parts

Oil grade	Colour	Part No.	
		Filling in the cylinder block	Filling in the rocker cover
Scania LDF-2	Blue	2 132 424	2 296 064
Scania LDF-3	Red	2 132 426	2 296 066
Scania LDF	Grey	2 269 345	2 296 071
ACEA E7	White	2 132 425	2 296 065
Scania Low Ash	Green	2 132 427	2 296 067
Scania Bioethanol	Black	2 132 428	2 296 068
Scania BEO-2	Orange	2 258 841	2 296 070
ACEA E9	-	2 132 429	2 296 069

Cleaning the centrifugal oil cleaner



WARNING!

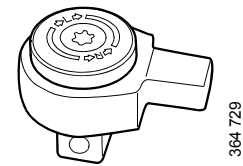
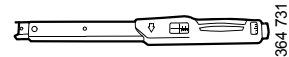
The oil may be hot. Carefully remove the cover from the centrifugal oil cleaner.

Tools

Torque wrench 2-20 Nm with exchangeable ratchet head

Ratchet head

Illustration



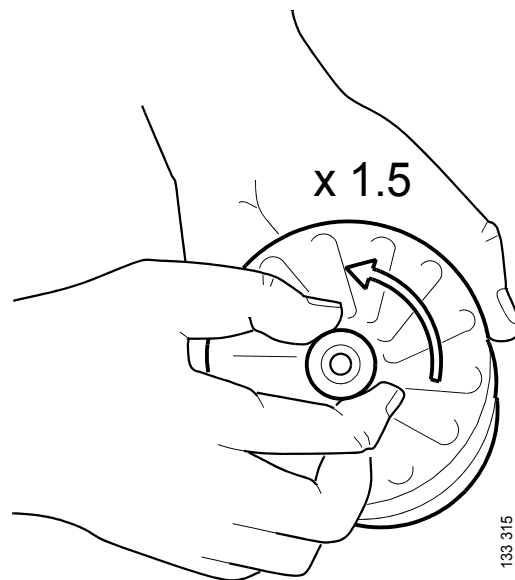
When the centrifugal oil cleaner is cleaned, there should be some dirt deposits in the rotor cover. This indicates that the rotor is working. If the rotor cover is clean, in other words the rotor is not working, the cause must be established immediately.

If the dirt deposits exceed 28 mm (1.1 in) at the recommended intervals, the rotor cover should be cleaned more often.

1. Clean the cover. Unscrew the nut securing the outer cover.
2. Let the oil run out from the rotor.
3. Lift out the rotor. Wipe off the outside. Undo the rotor nut and unscrew it about 1.5 turns to protect the bearing.

Note:

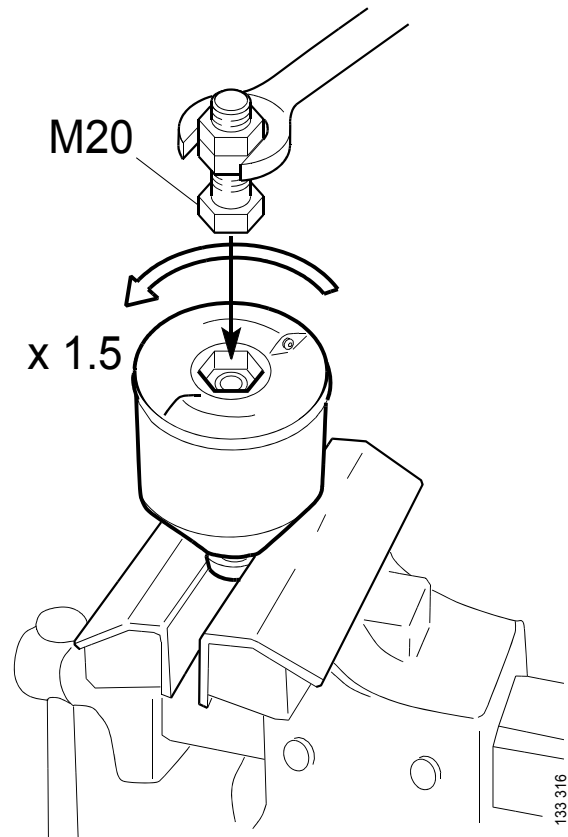
Take care not to damage the rotor shaft.



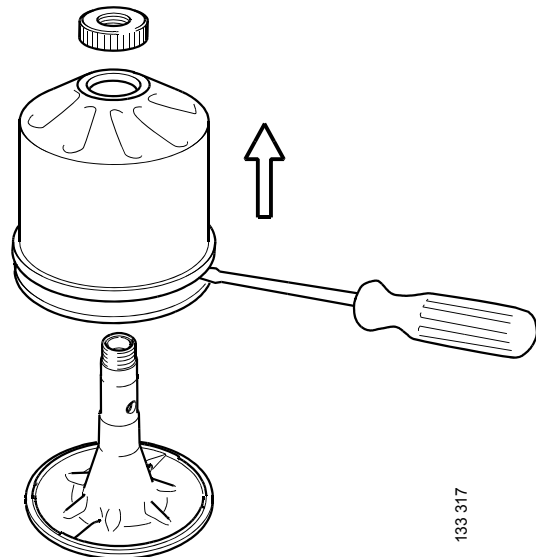
4. If the rotor nut is difficult to get loose, turn the rotor upside down and fasten the rotor nut in a vice. Turn the rotor anti-clockwise 1.5 turns by hand or use an M20 nut, see illustration.

**IMPORTANT!**

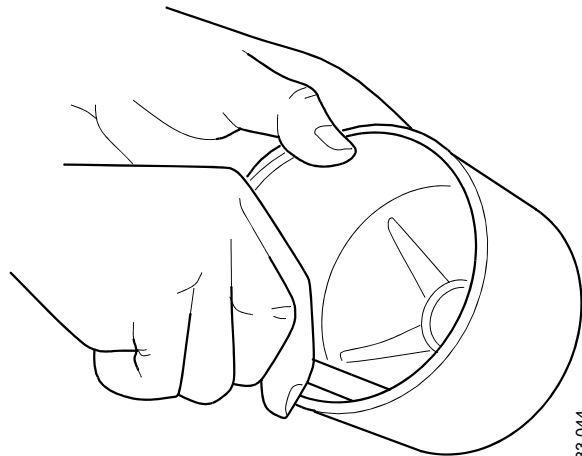
The rotor must not be put in a vice. Never strike the rotor cover. This may cause damage resulting in imbalance.



5. Remove the rotor cover by holding the rotor in both hands and tapping the rotor nut against the table. Never strike the rotor directly as this may damage its bearings.
6. Remove the strainer from the rotor cover. If the strainer is stuck, insert a screwdriver between the rotor cover and strainer and carefully prise them apart.

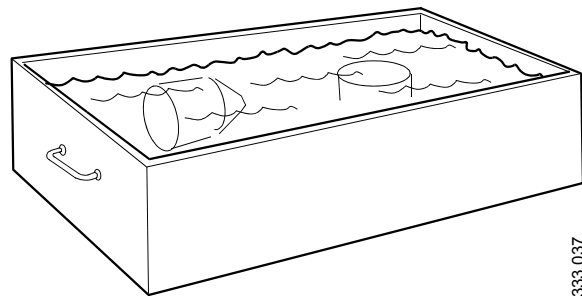


7. Remove the paper insert and scrape away any remaining dirt deposits inside the rotor cover. If the deposits are thicker than 28 mm (1.1 in), the centrifugal oil cleaner must be cleaned more often.



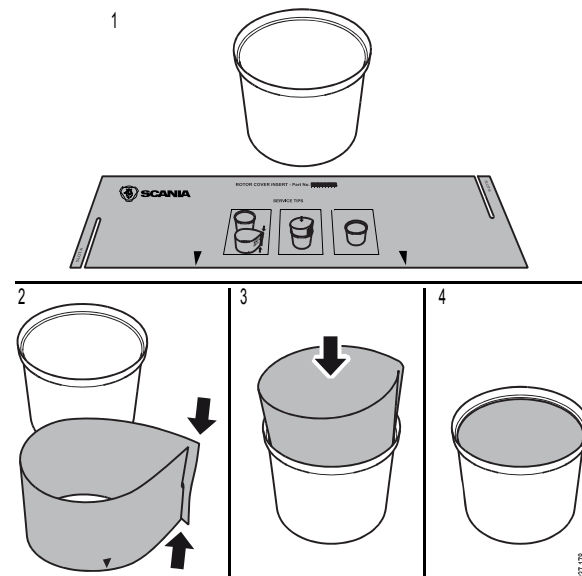
333 044

8. Wash the parts.



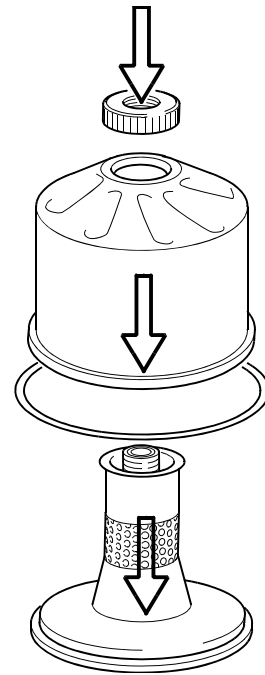
333 037

9. Check the 2 nozzles on the rotor. Ensure that they are not blocked or damaged. Renew any damaged nozzles.
10. Check that the bearings are undamaged. Renew damaged bearings.
11. Fit a new paper insert inside the rotor cover.



337 178

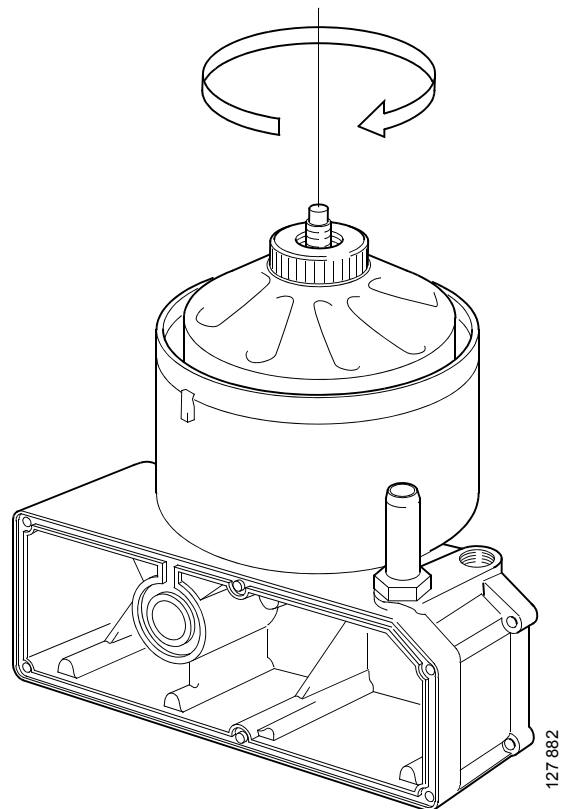
12. Fit the strainer onto the rotor.
13. Fit a new O-ring by sliding it over the strainer.
14. Refit the rotor cover. Ensure that the O-ring is not outside the edges.
15. Screw the rotor nut back on by hand.
16. Check that the shaft is not damaged or loose.
If the shaft is damaged or loose, see Workshop Manual 01-20.



Note:

Take care not to damage the rotor shaft.

17. Refit the rotor and rotate it by hand to make sure it rotates easily.



127 882

18. Fit a new O-ring in the cover. Refit the cover and tighten the lock nut.



IMPORTANT!

To reduce the risk of oil leakage it is important to tighten the cover to the correct tightening torque.

From engine serial number 6 841 928:

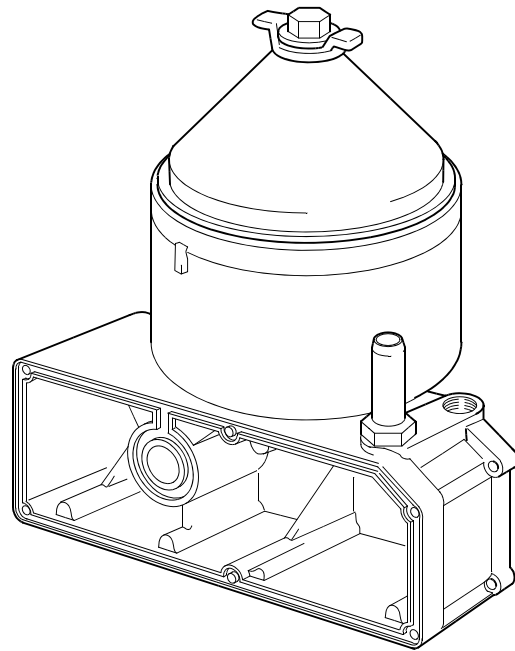
Tightening torque 20 Nm.

Older engine serial number:

Tightening torque 15 Nm.

Note:

A torque wrench together with a ratchet head is suitable for use during maintenance of the centrifugal oil cleaner.



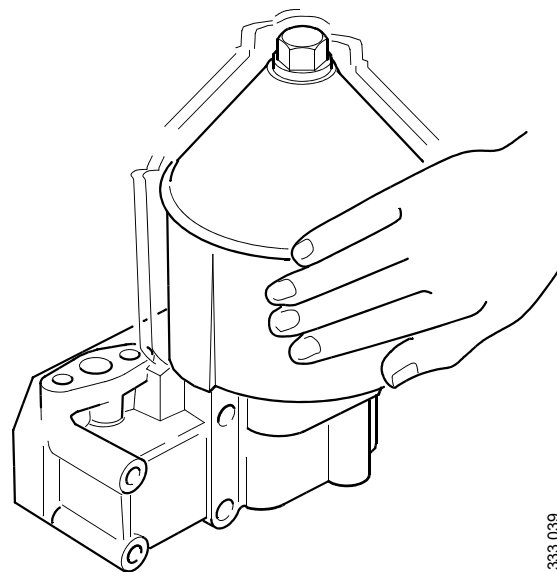
333 043

Operational testing

Operational testing need only be carried out if it is suspected that the centrifugal oil cleaner is malfunctioning. For example, if the dirt deposit is abnormally small given the distance driven.

The rotor rotates very fast and should continue to turn when the engine has stopped.

1. Run the engine until it reaches normal operating temperature.
2. Turn off the engine and listen for the sound from the rotor. Use your hand to feel if the filter housing is vibrating.
3. If the filter housing is not vibrating, dismantle and check the centrifugal oil cleaner.



333 039

Renewing the oil filter

Designation

Hexagon socket, drive 1/2", 36 mm

Illustration



IMPORTANT!

Clean the centrifugal oil cleaner at the same time as you change the oil filter. Otherwise, the oil filter will be blocked and resistance in the filter will increase. If this happens, an overflow valve in the filter retainer opens and lets the oil pass without being filtered.

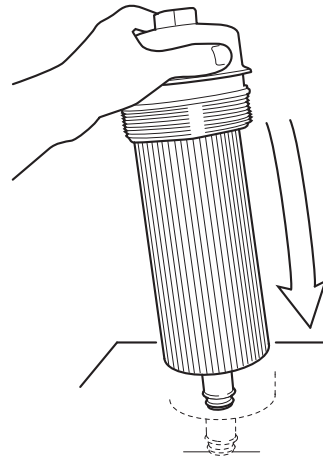
1. Unscrew the filter cover using the socket.



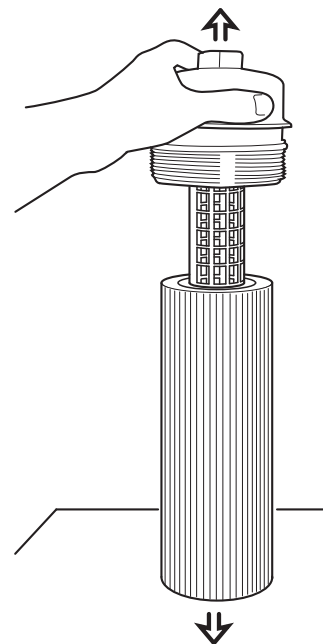
IMPORTANT!

Do not use an adjustable spanner or other open tool as there is risk of damaging the filter cover.

2. Lift out the filter housing cover with filter element. The filter housing will drain automatically once the filter has been removed.
3. Detach the old filter from the cover by holding the cover and carefully tapping the entire filter element against something hard. Remember that there will be oil splashes.
4. Fit the new filter and tighten the filter cover to 25 Nm (18 lbf ft).



312 503



312 502

Air cleaners

Reading the air cleaner vacuum indicator

If the indicator's red plunger is fully visible, renew the air cleaner filter element following the instructions below.

Renewing the air cleaner filter element

This procedure applies if the engine has an air cleaner with a filter element from Scania.



WARNING!

Never start the engine without the air filter as this could cause injury and severe engine damage.

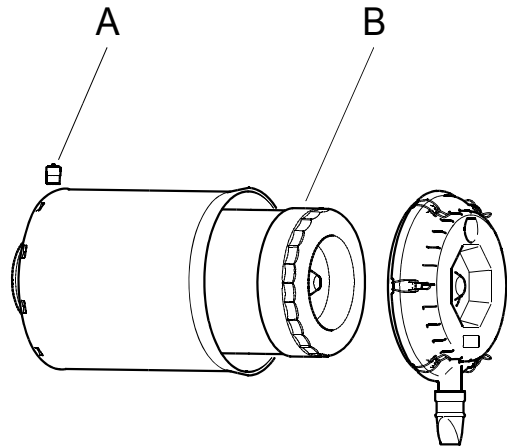
Note:

Renew the filter element earlier than the maintenance interval if the indicator shows red.

There is always a risk that the filter element will be damaged when it is cleaned.

The filter element must not be cleaned in water or be blown clean with compressed air.

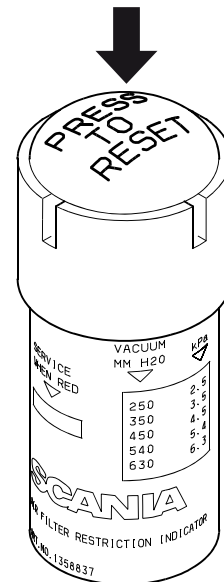
1. Remove the cover from the air cleaner.
2. Renew the filter element.
3. Carry out a check by inserting an inspection lamp into the element and checking from the outside that there are no holes or cracks in the filter paper.
4. Assemble the air cleaner.
5. Reset the vacuum indicator by pressing the button.



336 100

A Vacuum indicator.

B Filter element.



326 671

Renewing the air cleaner safety cartridge

This procedure applies if the engine has an air cleaner with a filter element from Scania.



WARNING!

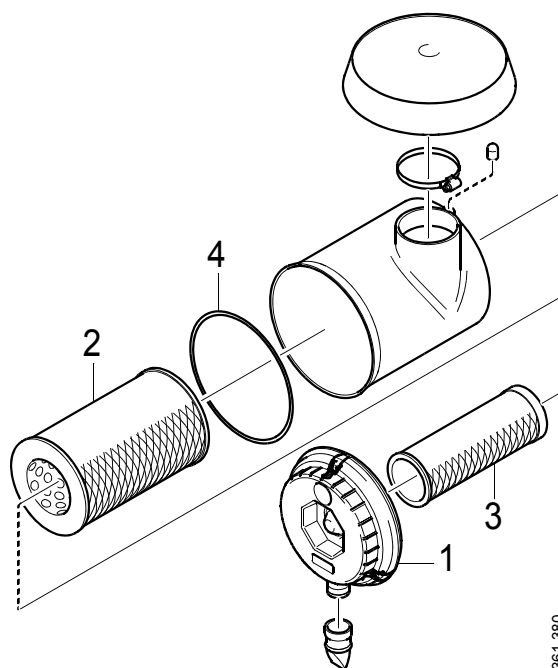
Never start the engine without the air filter as this could cause injury and severe engine damage.



IMPORTANT!

When you renew the safety cartridge, take great care to ensure that no dirt or other impurities get into the engine. Do not remove the safety cartridge unnecessarily.

1. Remove the cover from the air cleaner.
2. Remove the filter element.
3. Remove the safety cartridge.
4. Fit a new safety cartridge from Scania.
5. Renew or clean the filter element.
6. Check the condition of the O-ring. Renew the O-ring if it is damaged or hard.
7. Assemble the air cleaner. Ensure that the O-ring is not outside the edges.



361 360

Air cleaner.

1 Cover.

2 Filter element.

3 Safety cartridge.

4 O-ring.

Cooling system

Coolant



WARNING!

Ethylene glycol can be fatal if ingested and can cause skin irritation and eye damage.

Note:

The coolant should be changed when the cooling system is cleaned: every 6,000 hours or at least every 5 years. See Changing the coolant and cleaning the cooling system.

The coolant has several characteristics which are important for the operation of the cooling system:

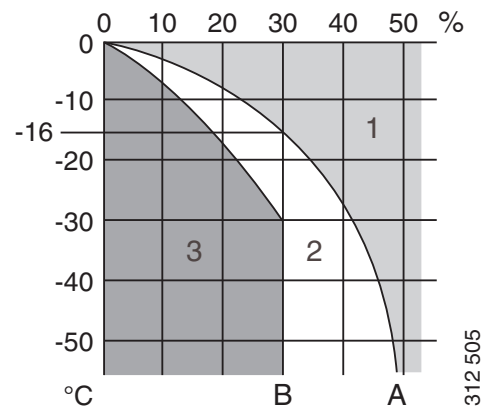
- Corrosion protection
- Frost protection
- Increases the boiling point

Scania recommends that the coolant used is a mixture of water with antifreeze and corrosion protection (ethylene glycol). The coolant should always contain 35-55% by volume of antifreeze and corrosion inhibitor so that the coolant has the correct properties for the cooling system to work.

Coolant resistance to cold

The following example shows coolant properties with 30 percent by volume of antifreeze and corrosion inhibitor:

- Ice slush starts to form at -16°C (3°F).
- At -30°C (-22°F), there is a risk of cooling system malfunction.
- There is no risk of damage by freezing with a minimum antifreeze and corrosion inhibitor content of 35 percent by volume.



The chart depicts coolant properties at different percents of antifreeze and corrosion inhibitor concentration by volume.

Curve A: Ice formation starts (ice slush)

Curve B: Damage by freezing occurs

Area 1: Safe area

Area 2: Malfunctions may occur (ice slush)

Area 3: There is risk of damage by freezing

Antifreeze and corrosion inhibitor concentration table

35% by volume of antifreeze provides sufficient protection against corrosion.

Example:

1. The total volume of the cooling system is 40 litres in this example.
2. The measured concentration of ethylene glycol is 35% by volume (freezing point -21°C). According to the table, there are 14 litres of ethylene glycol in the cooling system.
3. The measured concentration of ethylene glycol is 45% by volume (freezing point -30°C). According to the table, 18 litres of ethylene glycol are required in the cooling system.
4. Since there are already 14 litres in the cooling system, 4 litres of ethylene glycol must be added to the cooling system ($18 - 14 = 4$ litres).

	Adequate protection against corrosion					
Volume of ethylene glycol (%)	35	40	45	50	60	Cooling system volume (litres)
Ice slush forms ($^{\circ}\text{C}$)	-21	-24	-30	-38	-50	
Volume of ethylene glycol (litres)	11	12	14	15	18	30
	14	16	18	20	24	40
	18	20	23	25	30	50
	21	24	27	30	36	60
	25	28	32	35	42	70
	28	32	36	40	48	80
	32	36	41	45	54	90
	35	40	45	50	60	100
	39	44	50	55	66	110
	42	48	54	60	72	120
	46	52	59	65	78	130
	49	56	63	70	84	140
	53	60	68	75	90	150
	56	64	72	80	96	160
	60	68	77	85	102	170
63	72	81	90	108	180	
67	76	86	95	114	190	
70	80	90	100	120	200	

Antifreeze and corrosion inhibitor concentration table

35% by volume of antifreeze provides sufficient protection against corrosion.

Example:

1. The total volume of the cooling system is 10.6 US gallons in this example.
2. The measured concentration of ethylene glycol is 35% by volume (freezing point -6°F). According to the table there are 3.7 US gallons of ethylene glycol in the cooling system.
3. The measured concentration of ethylene glycol is 45% by volume (freezing point -22°F). According to the table, 4.8 US gallons of ethylene glycol are required in the cooling system.
4. Since the cooling system already contains 3.7 US gallons, fill another 1.1 US gallons of ethylene glycol in the cooling system (4.8 - 3.7 = 1.1 US gallons).

		Adequate protection against corrosion					
Volume of ethylene glycol (%)		35	40	45	50	60	Cooling system volume (US gallons)
Ice slush forms (°F)		-6	-11	-22	-36	-58	
Volume of ethylene glycol (US gallons)	2.9	3.2	3.7	4	4.8	7.9	
	3.7	4.2	4.8	5.3	6.3	10.6	
	4.8	5.3	6.1	6.6	7.9	13.2	
	5.5	6.3	7.1	7.9	9.5	15.9	
	6.6	7.4	8.5	9.2	11.1	18.5	
	7.4	8.5	9.5	10.6	12.7	21.1	
	8.5	9.5	10.8	11.9	14.3	23.8	
	9.2	10.6	11.9	13.2	15.9	26.4	
	10.3	11.6	13.2	14.5	17.4	29.1	
	11.1	12.7	14.3	15.9	19	31.7	
	12.2	13.7	15.6	17.2	20.6	34.3	
	12.9	14.8	16.6	18.5	22.2	37	
	14	15.9	18	19.8	23.8	39.6	
	14.8	16.9	19	21.1	25.4	42.3	
	15.9	18	20.3	22.5	26.9	44.9	
	16.6	19	21.4	23.8	28.5	47.6	
17.7	20.1	22.7	25.1	30.1	50.2		
18.5	21.1	23.8	26.4	31.7	52.8		

Antifreeze and corrosion protection products

Only Scania coolant or other products that Scania has tested to provide proper antifreeze and corrosion protection, may be used in Scania engines. Products that do not satisfy the requirements for use in a Scania engine can result in faults in and damage to the cooling system. This can lead to the invalidation of Scania's warranty for faults and damage caused by the use of inappropriate coolant.

The antifreeze and corrosion protection products used in Scania engines should be of the ethylene glycol type.

Scania concentrate

Coolant with antifreeze and corrosion protection.

Part No.	Volume litres	Volume US gallons
1 894 323	5	1.3
1 894 324	20	5.3
1 894 325	210	55
1 894 326	1,000	264

Scania Ready Mix

Ready mixed coolant with antifreeze and corrosion protection.

Part No.	Volume litres	Volume US gallons
1 921 955	5	1.3
1 921 956	20	5.3
1 921 957	210	55
1 896 695	1,000	264

Checking the coolant level



WARNING!

Do not open the coolant filler cap in the expansion tank if the engine is hot. Hot coolant and steam may spray out and cause burns.

If the cap has to be opened do it slowly and carefully to release the pressure before removing the cap. Wear gloves as the coolant is still very hot.



IMPORTANT!

It is not permissible to top up large amounts of coolant via the expansion tank. Filling via the expansion tank leads to air pockets in the cooling system which can lead to e.g. damage to the coolant pump shaft seal. If a large amount of coolant must be added, follow the instructions in the section Filling coolant.

Never fill a large amount of cold coolant in a hot engine. There is great risk of cracks forming in the cylinder block and cylinder heads.

Only pour pre-mixed coolant into the cooling system.

The following instructions apply to Scania expansion tanks. For other types of expansion tanks, follow the manufacturer's instructions.

1. Open the expansion tank cap and check the coolant level.
 - The right coolant level on a cold engine is even with the lower edge of the filler neck.
 - The right coolant level on a hot engine is approximately 25 mm (1 in) over the lower edge of the filler neck.
2. Top up with coolant as necessary.

Checking coolant antifreeze and corrosion protection

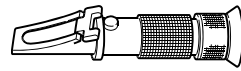
Note:

Use only pure fresh water that is free from particles, sludge and other impurities.

Tools

Refractometer

Illustration



1. Pour a small amount of coolant into a container and check that the coolant is pure and clear.
2. Change the coolant if it is contaminated or cloudy.
3. Measure the antifreeze and corrosion inhibitor content with a refractometer.

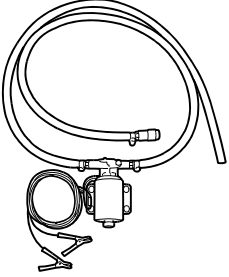
The following rules apply to ethylene glycol-based coolant:

- The antifreeze and corrosion inhibitor content must be minimum 35 percent by volume for corrosion protection to be sufficient.
- An antifreeze and corrosion inhibitor content greater than 55 percent by volume impairs the ability to protect against frost.
- If ice forms in the coolant, there are disruptions initially, but there is no immediate risk of damage. The engine should not be subjected to heavy loads when ice starts to form.

Changing the coolant and cleaning the cooling system

Draining coolant with pump

Special tools

Number, designation	
2 443 679, coolant pump	 <p style="text-align: right; font-size: small;">360 625</p>



WARNING!

Do not open the coolant filler cap in the expansion tank if the engine is hot. Hot coolant and steam may spray out and cause burns.

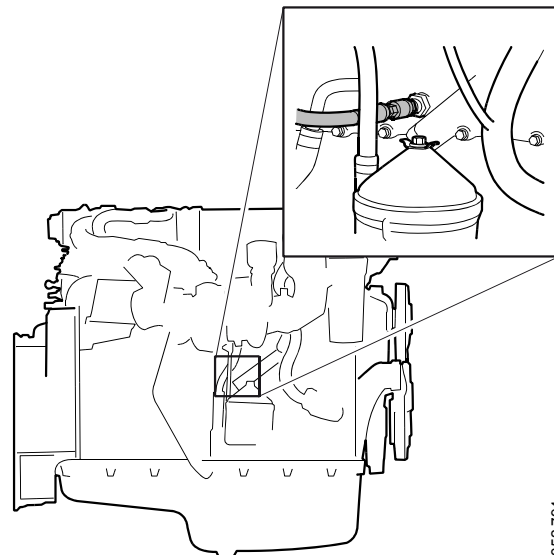
If the cap has to be opened do it slowly to release the pressure before removing the cap.

Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



Environment

Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.



352 794

1. Open the expansion tank cap.
2. Place the hose of the coolant pump in an empty container.
3. Connect the pump to the draining nipple in the cylinder block. See illustration.
4. Connect the pump's 2 cable terminals to the battery's negative and positive terminal.

Make sure that the drainage starts. If the drainage does not start: Change the position of the cable terminals.

5. Repeat the procedure at the cooling system's lowest drainage point. The location of the lowest drainage point on the engine may differ depending on engine application.

Draining coolant with coolant trolley



WARNING!

Do not open the coolant filler cap in the expansion tank if the engine is hot. Hot coolant and steam may spray out and cause burns.

If the cap has to be opened do it slowly to release the pressure before removing the cap.

Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



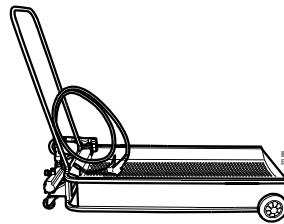
Environment

Use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

Designation

Coolant trolley

Illustration

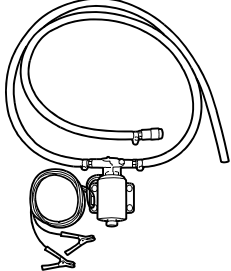


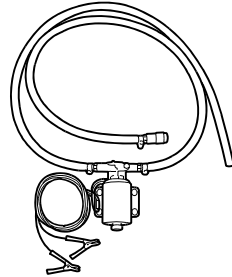
-
1. Remove the filler cap on the expansion tank.
 2. Drain the coolant at the following two points:
 - Lowest point of the cylinder block.
 - Lowest point of the cooling system.
 3. Close the drain taps.

Refilling coolant with pump

This procedure applies when the cooling system has been drained and needs to be filled with a large amount of coolant.

Special tools

Number, designation	Illustration
2 443 679, coolant pump	



360 625



WARNING!

Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



IMPORTANT!

It is not permissible to fill large amounts of coolant via the expansion tank. Filling via the expansion tank leads to air pockets in the cooling system which can lead to damage to the coolant pump shaft seal for example.

Never fill a large amount of cold coolant in a hot engine. There is great risk of cracks forming in the cylinder block and cylinder heads.

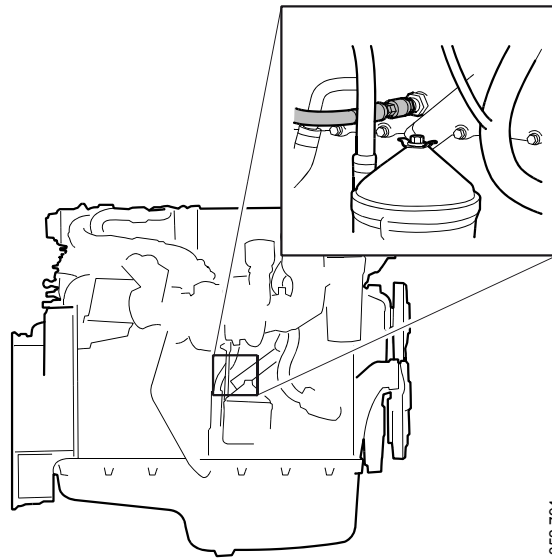
Fill the cooling system only with ready-mixed coolant. Mix the coolant as specified in the section headed Coolant.

Do not start the engine until the correct coolant level has been obtained. If the engine is started with a coolant level that is too low, the coolant pump shaft seal may be damaged, which can result in leaks.

1. Open the expansion tank cap.
2. Connect the coolant pump to the filler nipple in the cylinder block.
3. Connect the pump's 2 cable terminals to the battery's negative and positive terminal. Make sure that the filling starts. If the filling does not start: Change the position of the cable terminals.
4. Start the engine and run it at idling for 15 minutes.

**IMPORTANT!**

It is very important that the engine is idling. Engine overspeed could damage the coolant pump shaft seal, which leads to coolant leakage.



352 794

5. Switch off the engine and fill with coolant to the maximum level through the expansion tank.

Air pockets may still be left in the cooling system. These will disappear after the engine has been operated for a period of time. Therefore, the coolant may need topping up at a later stage.

Refilling coolant with coolant trolley

This procedure applies when the cooling system has been drained and needs to be filled with a large amount of coolant.



WARNING!

Use protective gloves as coolant can cause irritation if it comes in contact with the skin. Hot coolant can also cause scalding.



IMPORTANT!

When it is necessary to fill a large quantity of coolant, it must be pumped in from underneath. This is to ensure that air does not get into the cooling system, which can cause the coolant pump to overheat.



IMPORTANT!

Mix the coolant as specified under the section Coolant.

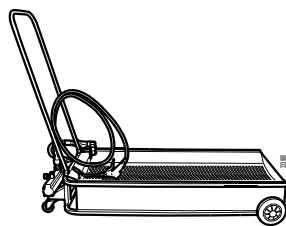


IMPORTANT!

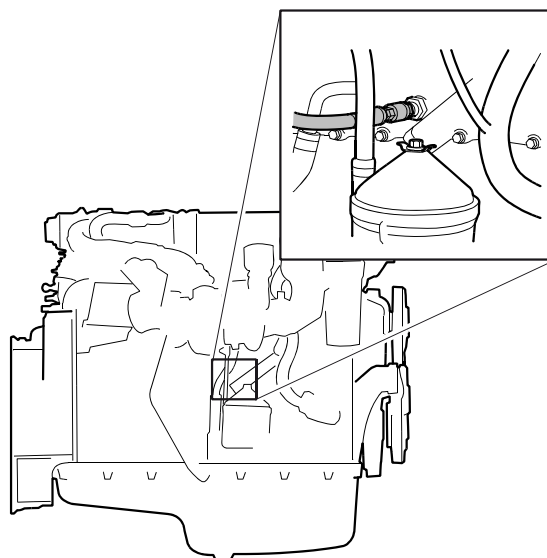
Do not start the engine until the correct coolant level has been obtained. If the engine is started with a coolant level that is too low, the coolant pump shaft seal may be damaged, which can result in leaks.

Designation

Coolant trolley



1. Connect the hose from the coolant trolley to the engine drain valve, see illustration.
2. Ensure that the cooling system bleed pipes are not blocked or damaged.
3. Open the expansion tank cap.
4. Fill with coolant using coolant trolley to pump up to the maximum level of the expansion tank.
5. Disconnect coolant trolley.



352 794

Note:

Idling speed must not exceed 600 rpm. Engine overspeed could damage the coolant pump shaft seal, which leads to coolant leakage.

For certain applications for Scania Engines it is not possible to reduce the idling speed to 600 rpm with the Scania settings. In these cases the engine must be run at the idling speed specified by the factory settings.

6. Start the engine and run it at idling speed for 15 minutes.
7. Stop the engine and fill with coolant to the maximum level through the expansion tank.
8. It is possible that a small amount of air may be left as air pockets in the cooling system. Therefore, always fill the expansion tank after the engine has warmed up and the thermostat has opened. It is necessary to run the engine for some time before all air will have disappeared from the cooling system, which may involve topping up at a later stage.

External: Cleaning the radiator and charge air cooler



IMPORTANT!

Do not use caustic soda or other alkaline detergent as this could damage the aluminium.



WARNING!

To ensure proper handling of detergent, study the warning text on the packaging concerned.

1. Check that the radiator and the charge air cooler are not clogged on the air side and that the cooling fins are not damaged.
2. Carefully scrape away any deposits from the radiator cooling fins. Use a paraffin-based engine cleaner if necessary.
3. Carefully straighten bent cooling fins using a steel brush or the like.

Internal: Removing oil and grease



Environment

Avoid spillage and use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

1. Run the engine until it has reached operating temperature and then drain the cooling system. See the Draining coolant section.
2. Remove the thermostats.
3. Fill the system with clean, hot water mixed with liquid dishwasher detergent intended for household machines. Concentration 1% (0.1/10 l).
4. Run the engine until it has reached operating temperature for approximately 20-30 minutes.
5. Drain the cooling system.
6. Fill the system with clean, hot water and run the engine for about 20-30 minutes.
7. Drain the water from the cooling system.
8. Refit the thermostats.
9. Fill the system with new coolant as described in the section Filling coolant.

Internal: Removing deposits



Environment

Avoid spillage and use a suitable container. Used coolant must be disposed of as specified in national and international laws and regulations.

1. Run the engine until it has reached operating temperature and then drain the cooling system. See the Draining coolant section.
2. Remove the thermostats.
3. Fill the system with clean, hot water mixed with some commercially available radiator detergent which is based on sulphamic acid and contains dispersing agents. Follow the manufacturer's instructions for the concentration and cleaning period.
4. Run the engine for the specified time.
5. Drain the cooling system.
6. Fill the cooling system with clean, hot water and run the engine for about 20-30 minutes.
7. Drain the water from the cooling system.
8. Refit the thermostats.
9. Fill the system with new coolant as described in the section Filling coolant.

Fuel system

Cleanliness requirements



IMPORTANT!

The whole fuel system is very sensitive to dirt and also very small particles. Foreign particles in the system can cause serious malfunctions. It is therefore very important that everything is as clean as possible when work is carried out on the fuel system. Wash the engine before carrying out repair work. If possible, a hot wash should be used.

It is strictly forbidden to carry out any machining work or work with compressed air near an open fuel system.

Be extra careful and always use clean, lint-free and dust-free clothes and disposable gloves when working on the fuel system. Scania recommends use of Tegera 848 gloves.

Clean tools before they are used and do not use any worn or chrome-plated tools. Material and flakes of chrome may come off.

Clean connections and the surrounding area before removal. When cleaning, cloths or paper which shed fibres must not be used. Use clean and lint free cloths, part number 588 879.

Plug or cover the connections during removal. Also clean the connections before the components are fitted. Place removed components on a thoroughly cleaned, dust-free surface. Scania recommends using a stainless steel bench top, part number 2 403 296. Cover the components with a lint-free cloth.

Checking the fuel level

- Check the fuel level and top up with fuel as necessary.

Note:

If the tank has been run dry or if the engine has not been used for a long time, bleed the fuel system. See the sections Bleeding the fuel system using a hand pump or Bleeding the fuel system using a suction tool.

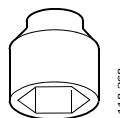
Renewing the fuel filter with draining nipple

Removal

Designation

Hexagon socket, drive 1/2", 36 mm

Illustration



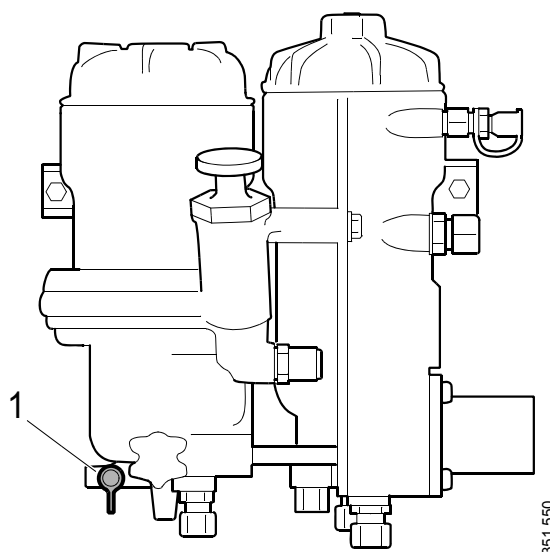
Environment

Avoid spillage and use a suitable container. Used fuel must be disposed of as specified in national and international laws and regulations.

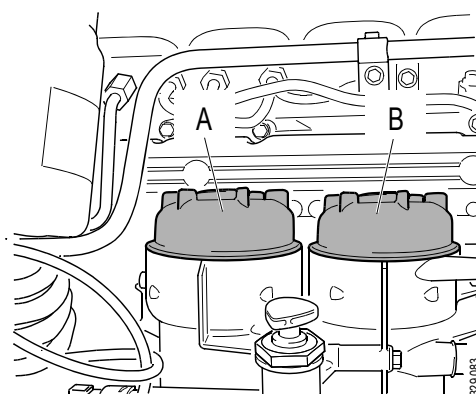
If the fuel tank is positioned higher than the fuel filter housing, the shut-off valve between the fuel tank and the fuel filter housing must be closed. This is to prevent fuel running into the fuel filter housing.

On certain engines, there is a draining nipple (1) on the fuel filter housing. If there is no draining nipple, see *Renewing the fuel filter using a suction tool* or *Renewing the fuel filter if there is no suction tool*.

1. Open the draining nipple (1).
2. To ensure that the filter housings are drained properly, the filter covers must be removed as follows:
 - On the pressure filter: Make a mark on the cover. Unscrew the cover 3 to 4 turns, use the socket.
 - On the water separating suction filter: Make a mark on the cover. Unscrew the cover 3 to 4 turns, use the socket.



351 550



320 083

A Water separating suction filter.

B Pressure filter.

- Wait at least 2 minutes to ensure the filter housings have drained properly.
- On the pressure filter: Unscrew the filter cover and lift it up slowly with the filter element.
- On the water separating suction filter: Unscrew the filter cover and lift it up slowly with the filter element.

The remaining fuel will drain out of fuel filter housing automatically once the filter elements have been removed.

3. Check that no fuel or particles remain in the bottom of the filter housings. Draw off remaining fuel and any particles.



IMPORTANT!

It is important to remove remaining fuel and particles from the filter housings to prevent fuel system contamination.

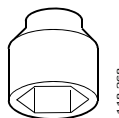
4. Undo the old filter elements from the covers by carefully bending them to one side.
5. Close the draining nipple.
6. Open the shut-off valve between the fuel tank and the fuel filter housing if it has been closed.

Fitting

Designation

Hexagon socket, drive 1/2", 36 mm

Illustration



IMPORTANT!

Check that there is no remaining packaging material stuck to the new filter elements.

Fit the filter elements in the filter covers before placing them in the fuel filter housings or the filter elements may be damaged.

In order to prevent back pressure in the filter housings when the filter elements are screwed on, the bleed nipple should be open.

1. Fit a new O-ring to the cover. Lubricate the O-ring with O-ring grease.
2. Press the filter elements into the snap fasteners on the covers.
3. Check that the filter housing is clean before fitting. Use lint free cloths.
4. Press down the filter elements into the fuel filter housings with the filter covers.
5. Screw down the filter covers until the cover seals are in contact with the filter housings. Use the socket.
6. Tighten the filter housings to 25 Nm (18 lbf ft).
7. Bleed the fuel system, see Bleeding the fuel system using a hand pump or Bleeding the fuel system using a suction tool.
8. Start the engine and check that there is no fuel leakage between the filter covers and filter housings. If there is leakage, undo the filter covers and start again from step 4.

Renewing the fuel filter using a suction tool

Removal

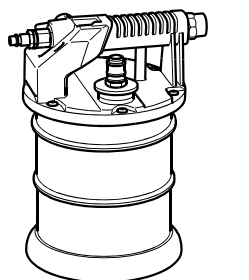
Designation

Hexagon socket, drive 1/2", 36 mm

Illustration



Suction tool



Environment

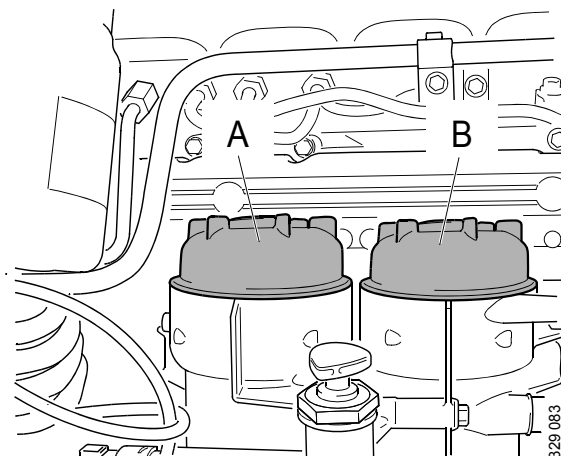
Avoid spillage and use a suitable container. Used fuel must be disposed of as specified in national and international laws and regulations.

To ensure that the filter housings are drained properly, the filter covers must be removed as follows:



IMPORTANT!

Start with the water separating suction filter (A). Do not open the pressure filter cover (B) until the filter housing for the water separating filter (A) is completely drained.



A Water separating suction filter.

B Pressure filter.

! **IMPORTANT!**

Do not use an adjustable spanner or other open tool to undo the filter covers, as this risks damaging the filter covers.

1. Make a mark on the water separating suction filter cover (A). Unscrew the cover 3 to 4 turns, use the socket.

! **IMPORTANT!**

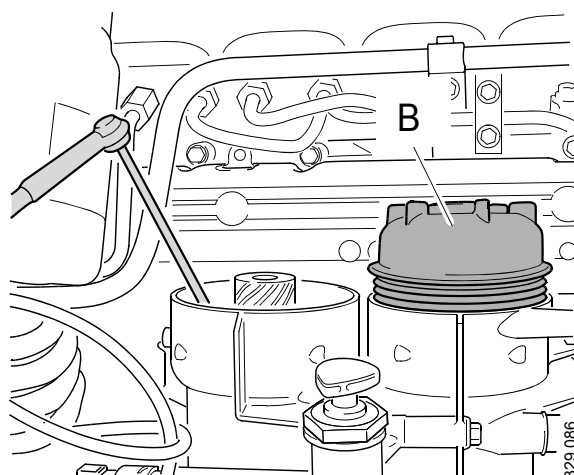
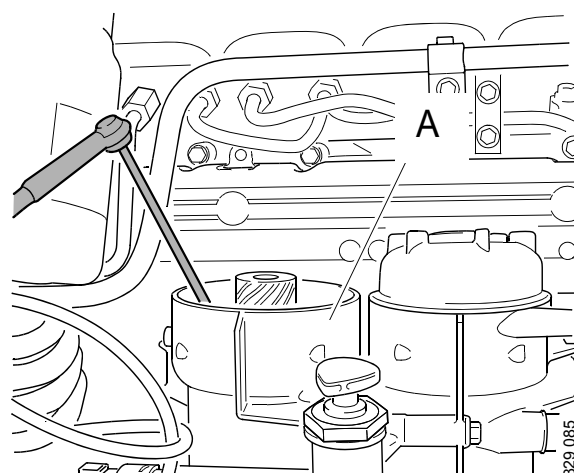
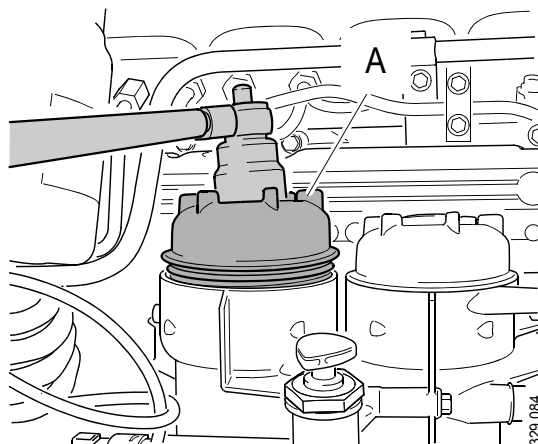
Wait a minimum of 2 minutes to allow as much of the fuel as possible to drain out of the filter housing.

2. Unscrew the filter cover (A) and lift it up slowly with the filter element.
3. Make sure the suction tool is completely drained before starting work. Draw out remaining fuel and any particles using the suction tool or a similar tool.
4. Keep the suction tool hose in the filter housing for the water separating suction filter (A).

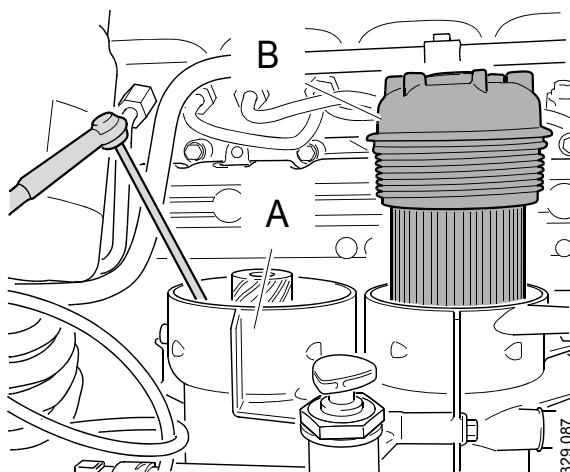
5. Make a mark on the pressure filter cover (B). Unscrew the cover 3 to 4 turns, use the socket. Draw out fuel which may drain into the water separating suction filter housing when the pressure filter is detached.

! **IMPORTANT!**

Wait a minimum of 2 minutes to allow as much of the fuel as possible to drain out of the filter housing.



6. Unscrew the pressure filter cover (B) and lift it up slowly with the filter element.
7. Fuel from the pressure filter housing (B) will flow into the water separating suction filter housing (A). Leave the suction tool in the water separating suction filter housing (A) until it is completely drained of fuel.



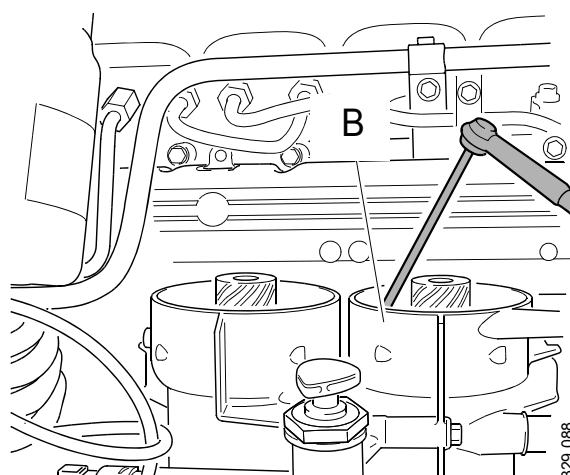
8. Move the suction tool to the pressure filter housing (B). Draw out remaining fuel and particles.



IMPORTANT!

It is important to remove remaining fuel and particles from the filter housings to prevent fuel system contamination.

9. Undo the old filter elements from the covers by carefully bending them to one side.

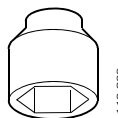


Fitting

Designation

Hexagon socket, drive 1/2", 36 mm

Illustration



IMPORTANT!

Check that there is no remaining packaging material stuck to the new filter elements.

Fit the filter elements in the filter covers before placing them in the fuel filter housings or the filter elements may be damaged.

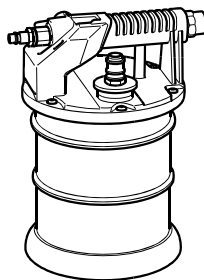
In order to prevent back pressure in the filter housings when the filter elements are screwed on, the bleed nipple should be open.

1. Fit a new O-ring to the cover. Lubricate the O-ring with O-ring grease.
2. Press the filter elements into the snap fasteners on the covers.
3. Check that the filter housing is clean before fitting. Use lint free cloths.
4. Press down the filter elements into the fuel filter housings with the filter covers.
5. Screw down the filter covers until the cover seals are in contact with the filter housings. Use the socket.
6. Tighten the filter housings to 25 Nm (18 lbf ft).
7. Bleed the fuel system, see Bleeding the fuel system using a hand pump or Bleeding the fuel system using a suction tool.
8. Start the engine and check that there is no fuel leakage between the filter covers and filter housings. If there is leakage, undo the filter covers and start again from step 4.

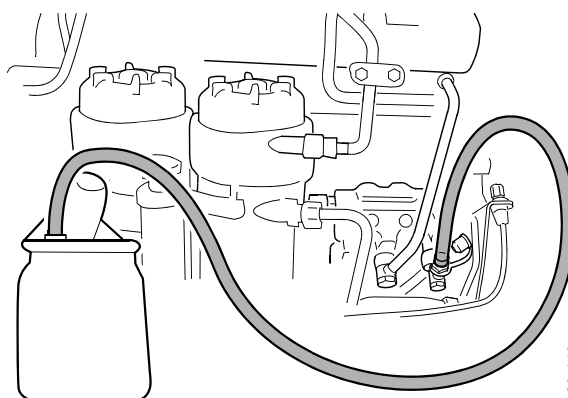
Bleeding the fuel system using a suction tool

Designation
Suction tool

Illustration



1. Open the bleed nipple at the high pressure pump and connect a clear plastic hose from the suction tool or similar tool.
2. Drain the suction tool. Hold the suction tool straight and draw out a full container of fuel. Bleeding is now complete.
3. Start the engine.



329 119

Bleeding the fuel system using a hand pump

1. Attach a clear plastic hose to the bleed nipple on the fuel filter housing. Let the plastic hose drop into a container that holds at least 5 litres.
2. Loosen the hand pump handle.
3. Open the bleed nipple and pump until fuel runs out, which will take around 100 pump strokes. Close the bleed nipple.
4. Start the engine and open the bleed nipple carefully. Approximately 3 litres will run out into the container before the fuel coming out will be free of air.

Other

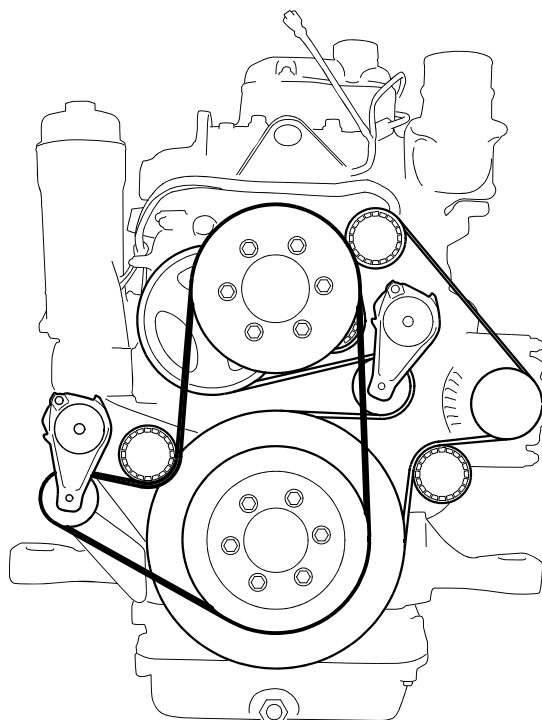
Checking the drive belt



IMPORTANT!

Refit the drive belt with the same direction of rotation as it had before removal.

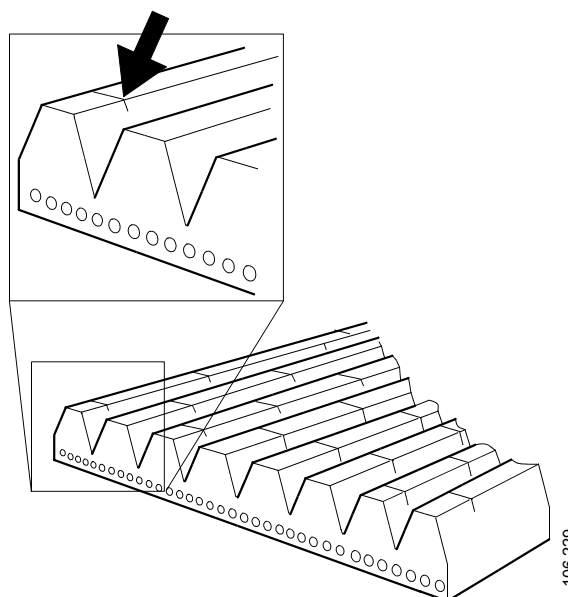
1. Check the drive belt thoroughly, particularly at the idler rollers.



312158

Example of a drive belt.

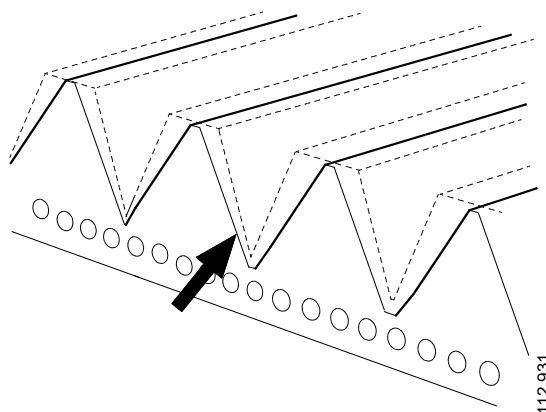
2. Check the drive belt for cracks. Renew the drive belt if cracks have formed.



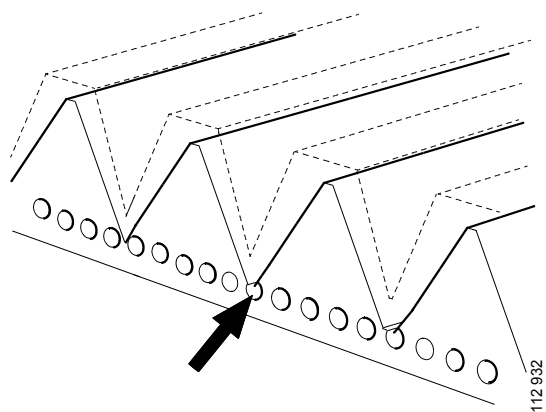
106 229

Example of a crack in the drive belt.

3. Check drive belt wear. Renew the drive belt if it is too worn. See the illustrations.



The drive belt is starting to become worn, but can be refitted.



The belt is worn down to the cord. The drive belt must be renewed.

Checking for leaks



IMPORTANT!

If serious leakage occurs, contact your nearest Scania workshop.

1. Start the engine.
2. Check for leaks in the lubrication, coolant, fuel, intake or exhaust system.
3. Tighten or renew leaking connections. Check the overflow holes which show whether the O-rings between the cylinder liners and crankcase are leaking.

Checking and adjusting the valve clearance

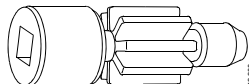
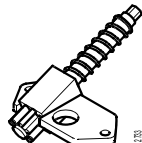
Adjusting may be carried out in one of two ways. Either by setting TDC on the flywheel or by following the tables showing which valves can be adjusted. Or by following the tables showing which flywheel position to set to adjust all valves on a cylinder.



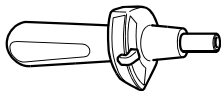
WARNING!

Block the starting device when working on the engine. If the engine starts unexpectedly, there is a serious risk of injury.

Special tools

Number	Designation	Illustration
99 309	Turning tool for rotating the flywheel from below.	
99 109	Turning tool for rotating the flywheel from above.	

Tools

Designation	Illustration
Torque screwdriver.	

Note:

Checking and adjusting valve clearances should also be carried out one more time after the first 500 hours of operation. Then, the normal interval follows every 2,000 hours.

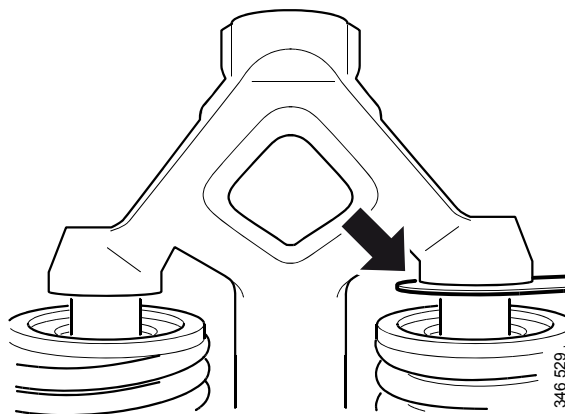
Valve transition occurs when the cylinder switches from exhaust stroke to intake stroke. The exhaust valve is closing while the intake valve is opening.

Carry out the adjustment on a cold engine.

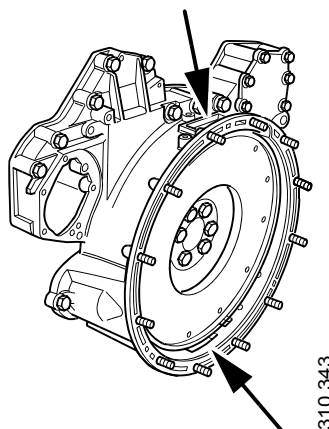
Specifications	
Valve clearance, intake valve	0.45 mm (0.018 in)
Valve clearance, exhaust valve	0.70 mm (0.028 in)

Max. clearance between two valves under the same valve bridge is 0.2 mm.

Tightening torque	
Lock nut for valves	35 Nm (26 lbf/ft)



1. Read the mark on the flywheel in one of the following ways:
 - Turn the flywheel in the direction of rotation of the engine using turning tool 99 309. Read the mark on the flywheel in the lower window of the flywheel housing.
 - Engines fitted with flywheels marked TDC UP: Fit turning tool 99 109 in flywheel housing holes of the upper window. Press the pinion into the external ring gear and turn the flywheel with a ratchet handle and a 14 mm socket. Read the mark in the upper window of the flywheel housing.
2. Adjust the valves according to Table for valve adjustment. It is a good idea to mark the rocker arm with a pen after adjustment to keep track of what has already been adjusted.



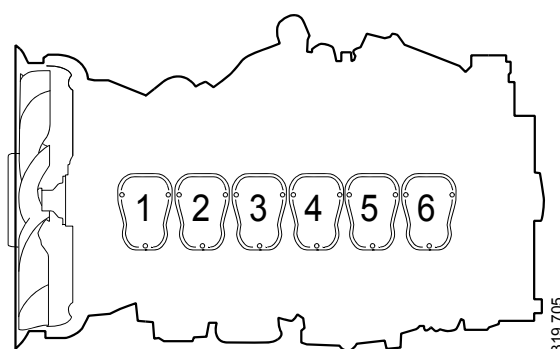
Window for reading the valve clearance.

Note:

Remember to remove the turning tool from the flywheel after adjustment.

Table for valve adjustment

Reading the mark on the fly-wheel in the lower window	Valve transition on cylinder	Adjust intake and exhaust valves on cylinder	Reading the mark on the fly-wheel in the upper window
TDC down	6	1	TDC up
120/480	2	5	300/660
240/600	4	3	60/420
TDC down	1	6	TDC up
120/480	5	2	300/660
240/600	3	4	60/420

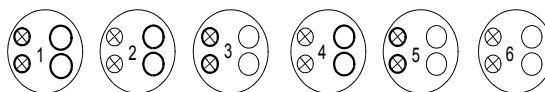


Cylinder location.

Adjustment using TDC

Set cylinder 1 exactly at TDC after the compression stroke. Adjust the following valves:

Cyl. 1	Intake valve and exhaust valve
Cyl. 2	Intake valve
Cyl. 3	Exhaust valve
Cyl. 4	Intake valve
Cyl. 5	Exhaust valve

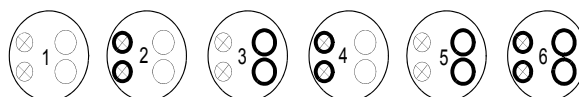


O Intake valve.

X Exhaust valve.

Turn the crankshaft exactly one revolution. Adjust the following valves:

Cyl. 2	Exhaust valve
Cyl. 3	Intake valve
Cyl. 4	Exhaust valve
Cyl. 5	Intake valve
Cyl. 6	Intake valve and exhaust valve



O Intake valve.

X Exhaust valve.

Renewing the reductant filter

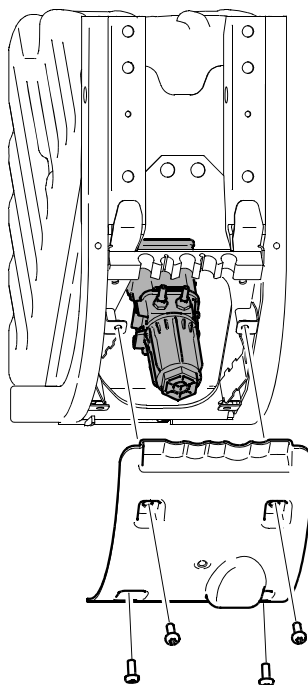
Designation

Hexagon socket, drive 1/2", 3/4", 46 mm

Illustration

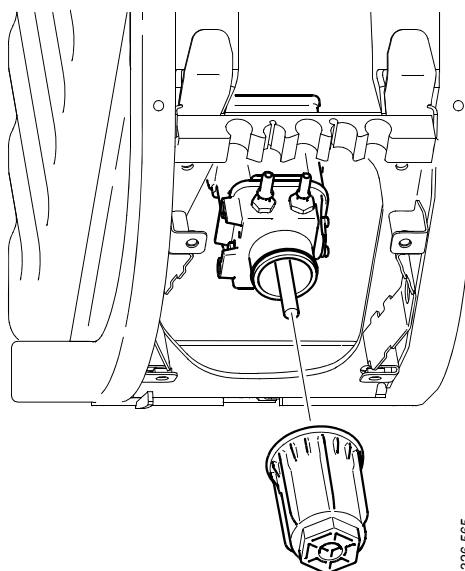


1. Remove the cover on the rear of the reductant tank.



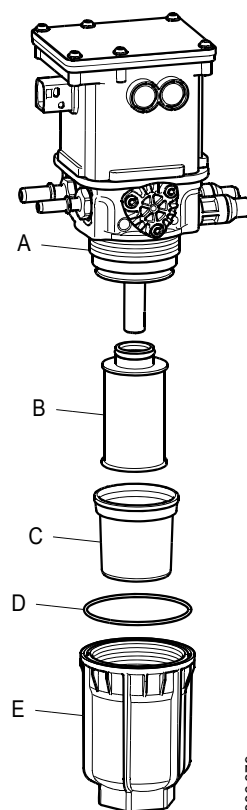
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2. Place a suitable container underneath.
3. Unscrew the filter cover. Use the socket.
4. Remove the filter cover and O-ring.



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5. Remove the frost protection device (C) and the filter (B).
6. Wipe the pump clean (A).
7. Fit the new filter (B).
8. Fit the new frost protection device (C).
9. Lubricate the threads with the spray.
10. Fit the new O-ring (D) in the new cover (E).
11. Check that the frost protection device and valve ring are correctly fitted in the new cover.
12. Fit the new cover and tighten to 80 Nm (59 lbf/ft).



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A Pump.

B Filter.

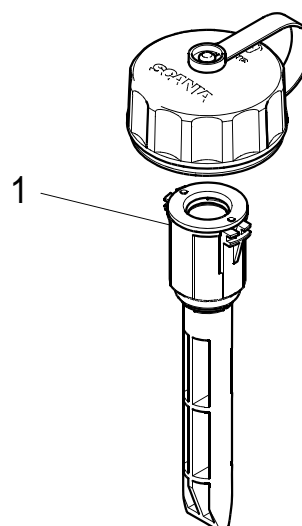
C Frost protection device.

D O-ring.

E Cover.

Cleaning the reductant tank filler filter

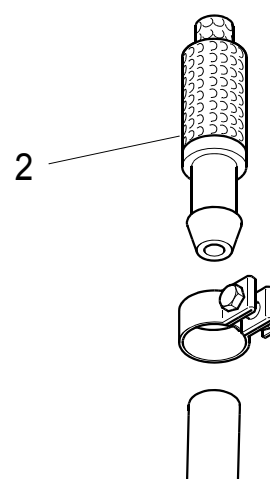
Make sure that the filler filter (1) is clean. If it is dirty: Clean the filler filter with clean water and refit it.



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Cleaning the reductant tank ventilation filter

Make sure that the ventilation filter (2) is clean. If it is dirty: Clean the ventilation filter with clean water and refit it.



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